5913 AT Command Appendix

CONTROL MICROSYSTEMS

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5913 AT Command Appendix

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1 Using AT Commands

The 5913 is shipped with factory default setting. These settings are shown in section ***4 5913 Factory Default* Settings.** These settings can be modified to suit your application preferences.

The 5913 powers up into an unconnected state and will respond to inquiry and connection requests. Then, just like controlling a modem, the host or client can issue AT commands which map to various *Bluetooth* activities. The command set is extensive enough to allow a host to make connections which are authenticated and encrypted or not. The 5913 is configured through simple ASCII strings over a remote *Bluetooth* RF connection.

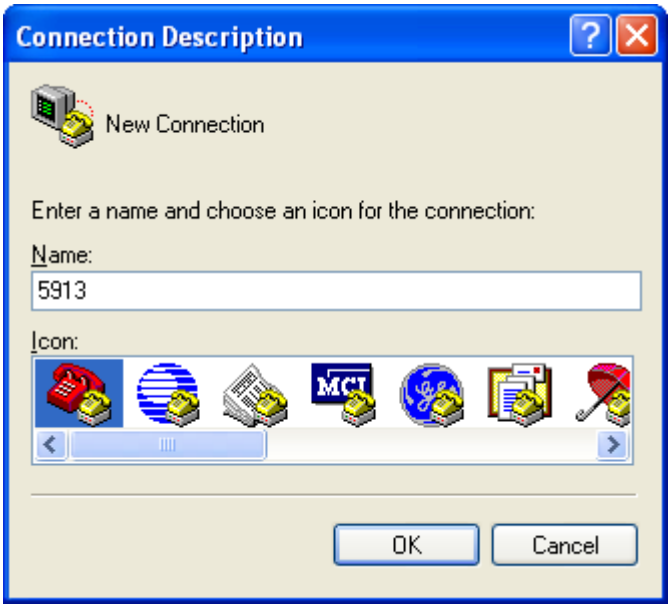
AT commands are sent from the host 5914 to the 5913 over the *Bluetooth* connection. The 5913 needs to be connected to a serial port on a SCADAPack controller and the 5914 needs to be connected to the host PC.

1.1 Using Windows HyperTerminal

The Windows program HyperTerminal is a terminal program that can be used to send AT commands to the 5913 from the host PC. This section of the user manual describes how to set up a terminal session using HyperTerminal.

- To Start HyperTerminal: **Start** >> **All Programs** >> **Accessories** >> **Communications** >> **HyperTerminal**.

When HyperTerminal is started you will see the following dialog. A name for the connection can be entered if desired.

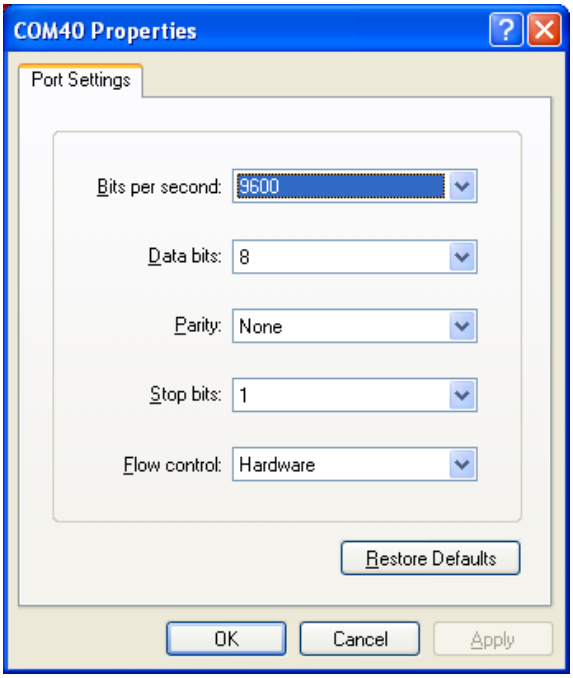


- Click **OK** once you are finished with this dialog.

The next dialog to appear sets the serial communication port on your PC to use when communicating with the 5913. The communication port Com40 is the typical default port, as seen in the 5914 installation.

- One you have selected the serial port click **OK**.

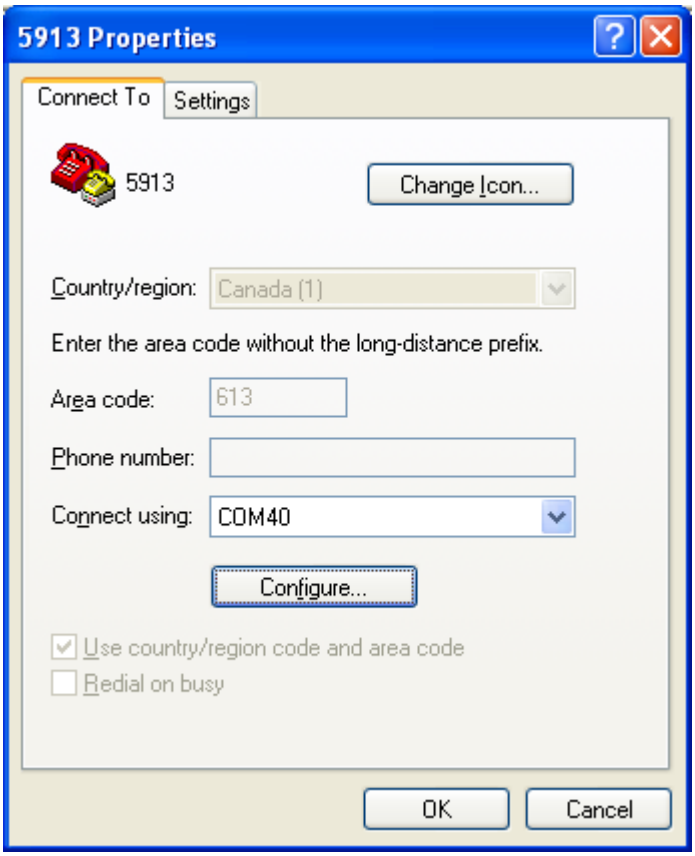
The next dialog is the properties dialog which sets the port settings.



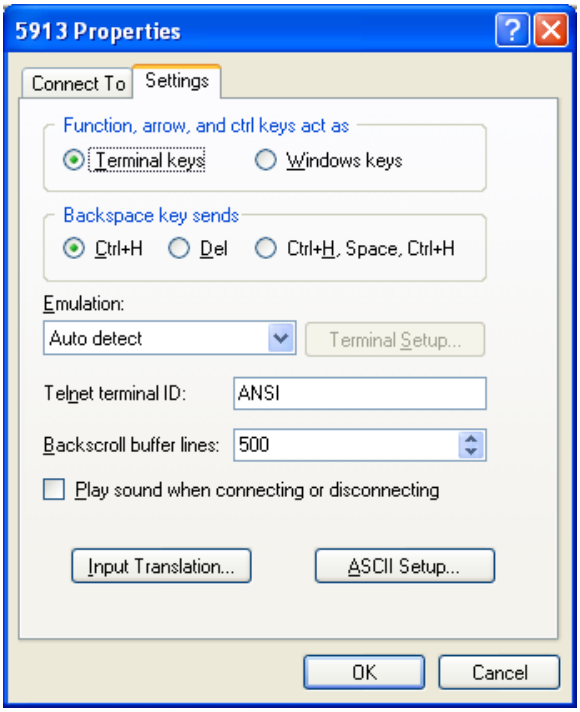
- Set the Port Settings as shown above. These are the default settings that the 5913 is shipped with. Click **OK** when finished.

The connection dialog now closes but there is one further setting that needs to be made.

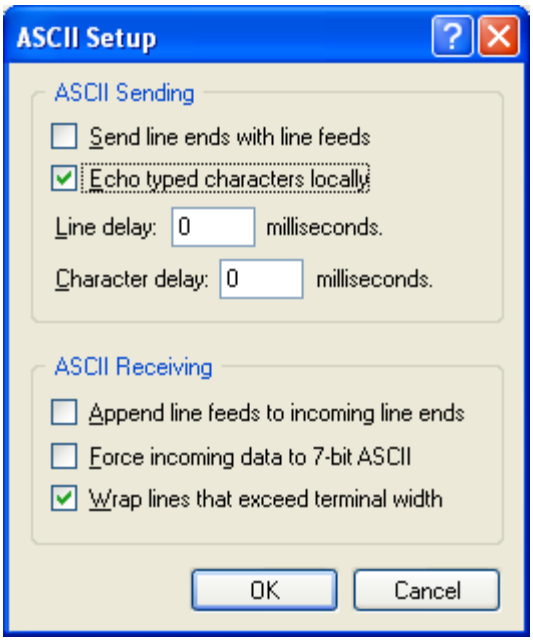
- From the **File** menu select **Properties**. The following dialog will appear.



- Click the **Settings** tab. The following page appears.

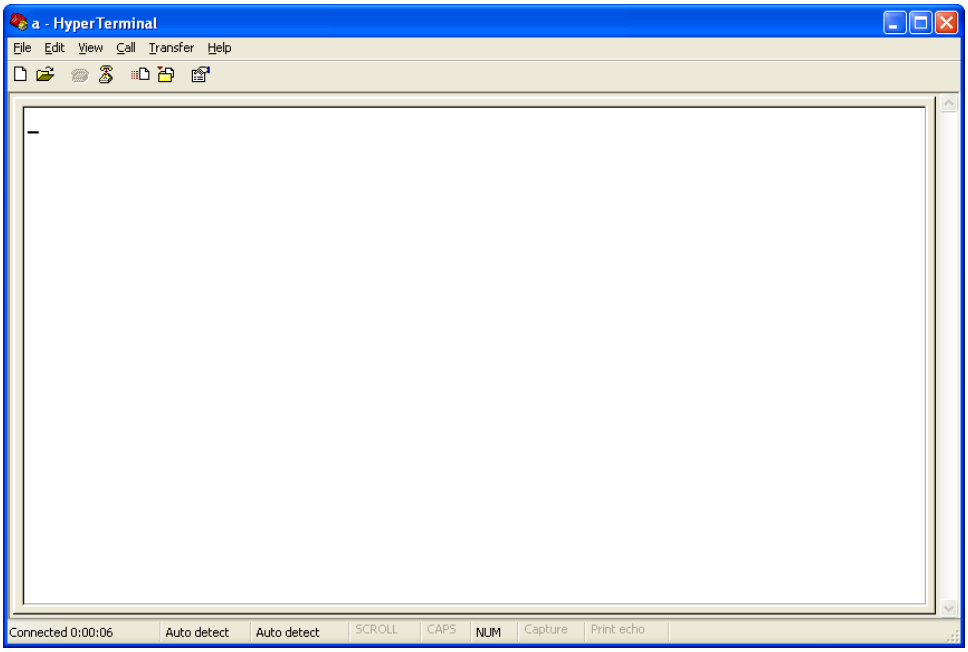


- Click the **ASCII Setup** button to open the ASCII Setup dialog.



- Select the **Echo typed characters locally** check box and click the **OK** button.

The HyperTerminal session is now configured for communication with the 5913.



1.2 Serial Port Communication Parameters

The serial port on the 5913 module is set for 9600 baud, 8 data bits, no parity and 1 stop bit at the factory. These setting may be viewed or changed using the following commands:

- To read the serial port (UART) settings use the **ATSI,8** command.
- To change the serial port (UART) settings use the **ATSW20** command.

1.2.1 Read the Serial Port Settings

Connect to the 5913 module using HyperTerminal (see section ***1.1 Using Windows HyperTerminal*** for details).

- Enable the Command mode by entering **+++ <CR>**.
- Enter the command **ATSI,8 <CR>** Get UART Settings.

The reply for the 5913 will be **OK** followed by **0027,000,000** when the 5913 is in the default factory condition. This somewhat cryptic response represents **<baud rate>, <parity>, <stop bits>**

When reading the UART settings the values are in HEX format. The following table shows the actual values for baud rate, parity and number of stop bits based on the HEX values returned from the **ATSI,8** command.

<baud rate>		**<parity>**		**<stop bits>**	
0005	1200	0000	None	0000	1
000A	2400	0001	Odd	0001	2
0014	4800	0002	Even		
0027	9600				
004F	19,200				
009D	38,400				
00EC	57,600				
01D8	115,200				
03B0	230,400				
075F	460,800				
0EBF	921,600				

1.2.2 Write the Serial Port Settings

Connect to the 5913 module using HyperTerminal (see section ***1.1- Using Windows HyperTerminal*** for details).

- Enable the Command mode by entering **+++<CR>**.
- Enter the command **ATSW20, <Baudrate>,<Parity>,<Stop Bits>,<Store><CR>**
- Note that this command does not return OK. The serial settings may be confirmed using the **ATSI,8** command.

The factory default setting of 9600,8,n,0 would be entered as **ATSW20,39,0,0,1**. The store parameter will save the setting to flash when set to 1. When the parameters are saved in flash they will be retained when power is removed from the 5913.

The serial parameters are entered as ASCII values as described in the table below.

Note: Serial port settings are read as HEX values and entered as ASCII values.

<baud rate>		<parity>		<stop bits>		<Store>	
0	1200	0	None	1	1	0	Do not store
5	2400	1	Odd	2	2	1	Store in flash
20	4800	2	Even				
39	9600						
79	19,200						
157	38,400						
236	57,600						
472	115,200						
944	230,400						
1887	460,800						
3775	921,600						

1.3 Setting Security

In many cases it is desirable to ensure a secure link between the 5913 and the 5914. This is achieved using the Personal Identification Number (PIN) of the 5913. When the 5913 is configured for security and another *Bluetooth* device attempts to make a connection it will be prompted for the 5913 PIN.

By default security on the 5913 is disabled at the factory. If you do not need a secure connection you can skip this section of the user manual. The 5913 will respond to queries from the 5914 and establish a link with it without enabling security.

Note on PIN Security: The 5913 and the 5914 provide authentication and encryption using the *Bluetooth* standard. A 10 to 16-character PIN provides excellent protection against attacks on the PIN; known attacks rely on a short PIN (4 numbers in many devices) to succeed quickly. The longer PIN protects against this attack.
The known attack can crack a 4-digit PIN in 0.06 seconds on a Pentium IV 3GHz HT computer. This attack relies on cycling through the 10^4 = 10000 possible values for the PIN. A 10-character PIN utilizing upper and lower case characters and digits provides 62^10 = 839,299,365,868,340,224 possibilities. This will take approximately 160,000 years on the same computer.

There are a number of AT commands that control the security settings and PIN in the 5913. See section ***2.11 Set and Read Security PIN Settings***.

The order for setting the PIN and using it when a link is established is as follows:

- Turn on 5913 security using command **SW24**.
- Reset the 5913 using a software reset command **URST**.
- Set the PIN from the factory default value of default to a 10 character PIN of your own choosing using command **ATSP**.

These AT commands are described in the following sections.

1.3.1 Turn on 5913 Security

Connect to the 5913 module using HyperTerminal (see section ***1.1 Using Windows HyperTerminal*** for details).

- Enable the Command mode by entering **+++ <CR>**.

The command **SW24 Write Response, Security, Auto SCO, Filter Settings** is used to enable 5913 *Bluetooth* security.

- Enter the command **ATSW24,0,1,0,0<CR>** to turn on security. The second parameter turns security on or off, a value of 1 will turn security on and a value of 0 will turn security off. See section ***2.13 Write 5913 Configuration Commands*** for complete details on the ATSW24command.
- Use command ATSI,6 to read the security settings.

1.3.2 Software Reset 5913

Once the security is turned on the 5913 *Bluetooth* needs to be reset for the change to take place.

Connect to the 5913 module using HyperTerminal (see section ***1.1 Using Windows HyperTerminal*** for details).

- Enable the Command mode by entering **+++ <CR>**.
- Enter the command **ATURST<CR>** to perform a software reset on the 5913. See section ***2.4 5913 Reset Commands*** for complete details on the ATURST command.

1.3.3 Change 5913 PIN

By default the 5913 PIN is set to **default**. This can be changed to any 10 character PIN using the ATSP command.

Connect to the 5913 module using HyperTerminal (see section ***1.1 Using Windows HyperTerminal*** for details).

- Enable the Command mode by entering **+++ <CR>**.
- Enter the command ATSP,<**newPIN**>,<**oldPIN**><**CR**>. The <newPIN> data is any 10 character sequence. The <oldPIN> data is the current PIN in the 5913. See section ***2.11 Set and Read Security PIN Settings*** for complete details on the ATSP command.

1.3.4 Important Security Notes

A factory reset does **NOT** reset the PIN. So you have to be very careful with typing the PIN. A factory reset does reset the security enable setting. So if you forget the PIN it is only possible to use the device without security settings.

The 5913 remembers a previous connection, i.e. if you connect successfully with correct authentication, the PIN isn't asked for again in the next connection attempt. It is possible to "unpair" all connections on the 5913 using command **ATCPAIR<CR>.** This will ensure that a PIN will be requested on the next connection.

2 AT Commands

The 5913 is configured, commanded, and controlled through simple ASCII strings over a remote *Bluetooth* RF connection. The host (PC) issues AT commands which map to various *Bluetooth* activities. The command set is extensive enough to allow a host to make connections which are authenticated and encrypted or not.

NOTE: The complete list of AT commands is presented in this section of the manual. These commands are divided into sections to make navigating the list easier. For most users most of these commands are not needed.

2.1 At Command Format

All commands are typed exactly as shown in the examples for each command.

<cr> = <0x0d carriage return>

<cr_lf> = <0x0d carriage return> <0x0a linefeed>

All commands are entered in the following format: "**COMMAND**"<cr>.

Valid commands respond with a <cr_lf>**OK**<cr_lf> or <cr_lf>**ERROR**<cr_lf>.

Only exceptions are ATSW20 and ATURST which do not reply.

All replied data after the command response has the following format <cr,lf>**data**<cr,lf>.

HEX vs. Decimal – When writing or entering integer AT Command string values enter them in Decimal format. When reading values from memory they will be returned in Hexadecimal format.

2.2 Attention (AT) Command Prefix

AT	**AT PREFIX** **Function:** The prefix AT must precede every valid command except for "+++". The remainder of the command script contains commands for the radio. The command script must end with a carriage return. **EXAMPLE:** *TYPE :* **AT**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> ***Note:*** AT Commands can be upper or lower case. The only exception is the radios Personal Identification alphanumeric Number (PIN) is caps sensitive, and ATOP.

2.3 Get 5913 Firmware Version Command

VER	**GET MODULE FIRMWARE VERSION** **Function:** Gets the radio's firmware version. **Format:** ATVER,ver1 **Return Parameters**: <Firmware Version>

	EXAMPLE: *TYPE :* **ATVER,ver1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**Ver 3.5.2.1.4.0**<cr_lf> ***Notes**:* • ‘‘ver1’’ is case sensitive, be sure to enter it in lower case. • Make sure the radio version number matches this document version before proceeding.

2.4 5913 Reset Commands

URST	**RESET** **Function:** Tells the radio to perform software reset on the CPU. **Format:** ATURST **EXAMPLE:** *TYPE :* **ATURST**<cr> *REPLY:* None ***Notes:*** • This unique Command does not reply with “OK” or “ERROR” because of internal UART data processing limitations and response timing. • You can send the reset command over the *Bluetooth* RF connection.
FRST	**FACTORY RESET** **Function:** Resets the radio back to factory defaults. **Format:** ATFRST **EXAMPLE:** *TYPE :* **ATFRST**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**RESET COMPLETE**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> ***Note:*** You can send the factory reset command over the *Bluetooth* RF connection.
SSW,0	**SET BYPASS FOR HARDWARE FACTORY CONFIGURATION RESET PUSHBUTTON** **Function:** Use this command to prevent an inadvertent factory configuration reset.

	Format: ATSSW,0,<Enable/Disable> **Parameters:** • Enable/Disable: 0 = factory reset enabled 1 = factory reset disabled **EXAMPLE:** *TYPE :* **ATSSW,0,1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATRSW,0
RSW,0	**READ BYPASS FOR HARDWARE FACTORY CONFIGURATION RESET PUSHBUTTON** **Function:** Reads the factory reset enable/disable register state. **Format:** ATRSW,0 **Return Parameters:** <Enable/Disable> **EXAMPLE:** *TYPE :* **ATRSW,0**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**00**<cr_lf> **Set Using:** ATSSW,0

2.5 Get 5913 Status Information

Status Information can be obtained directly from the *Bluetooth* Radio. This information is important when managing a connection list of devices in a local area and the current settings of the radio.

SI	**STATUS INFORMATION** **Function:** Gets specified status information from the LOCAL radio. **Format:** ATSI,<Status Request> **Parameters:** • *Status Request:* Integer 0 – 22 ***Note:*** If the **Set Using** field is listed, see the listed AT command for more info on return parameters. **0 GET MODULE TYPE**

Return Parameters: <Module Type>

EXAMPLE:

TYPE : **ATSI,0**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**BlueRadios ATMP**<cr_lf>

1 GET BT ADDRESS

Return Parameters: <BT Address>

EXAMPLE:

TYPE : **ATSI,1**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**123456789012**<cr_lf>

2 GET FRIENDLY NAME

Set Using: ATSN

Return Parameters: <Friendly Name>

EXAMPLE:

TYPE : **ATSI,2**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf> **BlueRadios** <cr_lf>

3 GET CURRENT CONNECTION STATUS (CH00-CH03)

Return Parameters: <Connection Status>

Connection Status:

Single Connection Format: (Mode, Ch00 State)

MP Format: (Mode,Ch00 State,Ch01 State,Ch02 State,Ch03 State)

Repeater Format: (Mode,Slave-Ch00 State,Master-Ch01 State)

Modes: 0 = Slave, 1 = Auto-Master, 2 = Idle, 3 = Slave Undiscoverable, 5 = Repeater, 6 = Mesh

States: 0 = Disconnected, 1 = Connected

EXAMPLE:

TYPE : **ATSI,3**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**1,0,0,0,0**<cr_lf>

Note: This command does not report the status of any FTP or OPP connections, use ATSI,22 to obtain FTP/OPP status.

4 GET SERVICE NAME

Set Using: ATSSN

Return Parameters: <Service Name>

EXAMPLE:

TYPE : **ATSI,4**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**COM0**<cr_lf>

5 GET CLASS OF DEVICE (COD)

Set Using: ATSC

Return Parameters: <COD>

EXAMPLE:

TYPE : **ATSI,5**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**00000000**<cr_lf>

6 GET RESPONSE, SECURITY, AUTO SCO, FILTER SETTINGS

Set Using: ATSW24

Return Parameters: <Response Type>,<Security>,<Auto SCO>,<Minor Filter>

EXAMPLE:

TYPE : **ATSI,6**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**0,0,0,0**<cr_lf>

7 GET CONNECTION, COMM, UNCONNECTED UART, DEFAULT SERVICE MODES

Set Using: ATSW25

Return Parameters: <Power-Up Connection Mode>,<Comm Mode>, <Unconnected UART Mode>,<Default Service>

EXAMPLE:

TYPE : **ATSI,7**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**0,1,0,0**<cr_lf>

8 GET UART SETTINGS

Set Using: ATSW20

Return Parameters: <Baudrate>,<Parity>,<Stop Bits> (HEX)

EXAMPLE:

TYPE : **ATSI,8**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**0027,0000,0000**<cr_lf>

9 GET MASTER AUTO-CONNECT ADDRESS

Set Using: ATSMA

Return Parameters: <BT Address>,<UUID>

EXAMPLE:

TYPE : **ATSI,9**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**Not Set!**<cr_lf>

OR

<cr_lf>**OK**<cr_lf>

<cr_lf>**123456789012,1101**<cr_lf>

10 GET SLAVE SCAN INTERVALS AND WINDOWS

Set Using: ATSW21

Return Parameters: <psInterval>,<psWindow>,<isInterval>,<isWindow> (HEX)

EXAMPLE:

TYPE : **ATSI,10**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**0400,0200,0400,0200**<cr_lf>

11 GET PIO(5) PULSE RATE

Set Using: ATSW27

Return Parameters: <Pulse Period [ms]> (HEX)

EXAMPLE:

TYPE : **ATSI,11**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**03E8**<cr_lf>

12 GET ESCAPE CHARACTER

Set Using: ATSESC

Return Parameters: <ASCII Char> (HEX)

EXAMPLE:

TYPE : **ATSI,12**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**2B**<cr_lf>

13 GET INQUIRY AND MASTER CONNECT TIMEOUT SETTINGS

Set Using: ATSW28

Return Parameters: <Inquiry Timeout>,<Master Connect Request Timeout> (HEX)

EXAMPLE:

TYPE : **ATSI,13**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**0010,0028**<cr_lf>

14 GET MAX TX POWER LEVEL

Set Using: ATSPF

Return Parameters: +/-<Power Level> (HEX)

EXAMPLE:

TYPE : **ATSI,14**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**default**<cr_lf>

OR

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**+0A**<cr_lf>

15 GET PIN LOCK MODE

Set Using: ATSW29

Return Parameters: <Lock Mode> (HEX)

EXAMPLE:

TYPE : **ATSI,15**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**00**<cr_lf>

16 GET DEEP SLEEP MODE

Set Using: ATSW30

Return Parameters: <Deep Sleep Mode> (HEX)

EXAMPLE:

TYPE : **ATSI,16**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**00**<cr_lf>

17 GET SNIFF SETTINGS

Set Using: ATSSNIFF

Return Parameters: <Max Interval>,<MinInterval>,<Attempt>,<Timeout> (HEX)

EXAMPLE:

TYPE : **ATSI,17**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**Not Set!**<cr_lf>

OR

<cr_lf>**OK**<cr_lf>

<cr_lf>**0000,0000,0000,0000**<cr_lf>

18 GET LINK SUPERVISORY TIMEOUT

Set Using: ATLSTO

Return Parameters: <Time> (HEX)

EXAMPLE:

TYPE : **ATSI,18**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

<cr_lf>**04**<cr_lf>

19 GET LIST OF PAIRED OR SECURED ADDRESSES

Set Using: ATPAIR

Return Parameters: Index,<BT Address> (HEX)

EXAMPLE:

TYPE : **ATSI,19**<cr>

REPLY: <cr_lf>**OK**<cr_lf>

00,<cr_lf>

01,<cr_lf>

02,<cr_lf>

03,<cr_lf>

Note: 00 – 03 Are for indexing the stored addresses only, they do not indicate that the address is associated with any specific channel.

20 GET CHANNEL UUIDS

Set Using: ATSSNC

Return Parameters: <Ch00 UUID>,<Ch01 UUID>,<Ch02 UUID>,<Ch03 UID> (UUIDs for Ch01-03 will only be returned if enabled using ATSSW3)

EXAMPLE:

TYPE : **ATSI,20**<cr>

	REPLY: <cr_lf>**OK**<cr_lf> <cr_lf>**1101**<cr_lf> //Point to point OR <cr_lf>**1101,1101,1101**<cr_lf> //Multipoint with 3 channels **21 GET SPECIFIC TRANSMISSION CHANNEL** **Set Using:** ATSWC **Return Parameters**: <Selected>,<Channel> **EXAMPLE:** *TYPE :* **ATSI,21**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**01,03**<cr_lf> **22 GET FTP/OPP CONNECTION STATUS** **Return Parameters:** <Connection Status> **Connection Status:** 0 = Disconnected, 1 = Connected **EXAMPLE:** *TYPE :* **ATSI,22**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**1**<cr_lf>

2.6 Set and Read 5913 Boot Mode

SSW,1	**SET BOOT MODE**
	Function: Sets the boot mode.
	Format: ATSSW,1,<Boot Mode>
	Parameters:
	• Boot Mode:
	0 = VM Mode // Default baud rate = 9600, 8-N-1
	1 = HCI Mode // Fixed baud rate = 115.2k, 8-N-1
	2 = BCSP Mode // Fixed baud rate = 115.2k, 8-N-1
	Factory Default: VM Mode
	EXAMPLE:
	TYPE : **ATSSW,1,1**<cr>
	REPLY: <cr_lf>**OK**<cr_lf>
	OR

	<cr_lf>**ERROR**<cr_lf> **Read Using:** ATRSW,1 **Note:** All AT Commands work only with the VM.
RSW,1	**READ BOOT MODE** **Function:** Gets the boot mode. **Format:** ATRSW,1 **Return Parameters:** <Boot Mode> **EXAMPLE:** *TYPE :* **ATRSW,1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**00**<cr_lf> **Set Using:** ATSSW,1

2.7 Set and Read 5913 Security Level

SSW,2	**SET SECURITY LEVEL** **Function:** Sets the Security Level register state. **Format:** ATSSW,2,<Security Level> **Parameters:** • Security Modes: 0 = Link Level – Highest level of security. 1 = Service Level – Provides service information without using PIN. **Factory Default:** VM Mode **EXAMPLE:** *TYPE :* **ATSSW,2,1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATRSW,2
RSW,2	**SECURITY LEVEL** **Function:** Gets the Security level register state. **Format:** ATRSW,2 **Return Parameters:** <Boot Mode>

	EXAMPLE: *TYPE :* **ATRSW,2**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**00**<cr_lf> **Set Using:** ATSSW,2

2.8 Set and Read Maximum Number of *Bluetooth* Connections

SSW,3	**SET MAX CONNECTION NUMBER** **Function:** Sets the maximum number of *Bluetooth* connections. Enables multipoint mode if number of connections is greater than one. **Format:** ATSSW,3,<Number of Connections> **Parameters:** • *Number of Connections:* Integer Value 1-4 **Factory Default:** 1 **EXAMPLE:** *TYPE :* **ATSSW,3,1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> **Notes:** • Fast Data Mode is only supported with 1 connection and ##,00 packet header is never sent. It is recommended you limit the number of connections for your application to maximize performance and security. • Requires a reset for change to take affect. • By default data is broadcast to all connected radios when the local radio is in data mode. The radio can be set to transmit to a specific channel using the ATSWC command. (See the Utilities section for more information).
RSW,3	**READ MAX CONNECTION NUMBER** **Function:** Reads the maximum number of *Bluetooth* connections. **Format:** ATRSW,3 **Return Parameters:** <Max Connections> **EXAMPLE:** *TYPE :* **ATRSW,3**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**01**<cr_lf>

2.9 Set and Read 5913 Name

When another *Bluetooth* Radio performs a discovery, this will be the name that is passed to that radio. Please take note, unlike the name, the 5913 *Bluetooth* address is fixed (48bit) at the factory and is unique to every *Bluetooth* device manufactured.

SN	**SET RADIO NAME** **Function:** Sets the local radio's friendly name. **Format:** ATSN,<Name> **Parameters:** • *Name:* 16 alphanumeric characters MAX **Factory Default:** BlueRadio **EXAMPLE:** *TYPE :* **ATSN,MYRADIOS_0123456**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,2
RRN	**READ REMOTE RADIO NAME BY BLUETOOTH ADDRESS** **Function:** Gets a remote radio's friendly name using its *Bluetooth* address. **Format:** AT*RRN*,<BT Address> **Parameters:** • *BT Address: Bluetooth* Address, 12 hex characters MAX **Return Parameters:** <Radio Name> **EXAMPLE:** *TYPE :* **ATRRN,0123456789012**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**Bluetooth**<cr_lf> OR <cr_lf>**NO ANSWER**<cr_lf> **Note:** The timeout for this command is controlled by the master connect timeout in ATSW28.

2.10 Set and Read Service Name for Local and Remote Devices

SSN	**SET SERVICE NAME**

	Function: Sets the *Bluetooth* Service Name of channel 0 on the local device. **Format:** ATSSN,<Service Name> **Parameters:** • Service Name: 16 alphanumeric characters MAX **Factory Default:** "COM0" **EXAMPLE:** *TYPE :* **ATSSN,COM0**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,4 or ATRSN **Note:** Requires a reset for change to take affect.
SSNC	**SET SERVICE NAME BY CHANNEL** **Function:** Sets the local *Bluetooth* Service Name and Service UUID by channel number. **Format:** ATSSNC,<Channel Number>,<Service Name>,<UUID> **Parameters:** • *Channel Number:* 0, 1, 2, 3 • *Service Name:* 16 alphanumeric characters MAX • UUID: 4 digit, binary profile code (See Appendix C for more info) **Factory Default:** "COM0" for Channel 0, "COM1" for Channel 1, "COM2" for Channel 2, "COM3" for Channel 3 **EXAMPLE:** *TYPE :* **ATSSNC,0,My Device,1101**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Note**: Requires a reset for change to take affect.
RSN	**READ SERVICE NAME** **Function:** Reads the local *Bluetooth* Service Name. **Format:** ATRSN **Return Parameters:** <Service Name> **EXAMPLE:** *TYPE :* **ATRSN**<cr>

	REPLY: <cr_lf>**OK**<cr_lf> <cr_lf>**COM0**<cr_lf>
RSNC	**READ SERVICE NAME BY CHANNEL** **Function:** Reads the local *Bluetooth* Service Name by channel number. **Format:** ATRSNC,<Channel Number> **Parameters:** • *Channel Number:* 0-3 **Return Parameters:** <Service Name> **EXAMPLE:** *TYPE :* **ATRSNC,0**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**COM0**<cr_lf>
RRSN	**READ REMOTE SERVICE NAME** **Function:** Reads a remote *Bluetooth* device Service Name and Service Channel Number for a specific profile. **Format:** ATRRSN,<BT Address>,<UUID> **Parameters:** • *BT Address: Bluetooth* Address, 12 hex characters MAX • UUID: 4 digit, binary profile code (See Appendix C for more info) **Return Parameters:** <Service Channel Number>,<Service Name> **EXAMPLE:** *TYPE :* **ATRRSN,123456789012,1101**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**01,Bluetooth Serial Port**<cr_lf> <cr_lf>**02,Bluetooth Serial Port (2)**<cr_lf> OR <cr_lf>**NO ANSWER**<cr_lf> **Note:** The timeout for this command is controlled by the master connect timeout in ATSW28.

2.11 Set and Read Security PIN Settings

SSW,6	**SET PIN REQUEST HANDLING MODE** **Function:** Sets the PIN (Personal Identification Number) request handling mode. If set to

	0 the PIN stored using the ATSP command will automatically be used during PIN exchanges. If set to 1 the prompt "PIN REQUEST" will be output by the radio and the user will need to manually enter a PIN using the ATPR command. **Format:** ATSSW,6,<Mode> **Parameters:** • *Mode:* 0 = Automatic PIN Request Handling 1 = Manual PIN Request Handling **Factory Default:** 0 **EXAMPLE:** *TYPE :* **ATSSW,6,1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATRSW,6 **Note:** Requires a reset for change to take affect.
RSW,6	**READ PIN REQUEST HANDLING MODE** **Function:** Reads the PIN request handling mode. **Format:** ATRSW,6 **Return Parameters:** <Mode> **EXAMPLE:** *TYPE :* **ATRSW,6**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**00**<cr_lf> **Set Using:** ATSSW,6
SP	**SET PIN** Function: Sets the PIN to be used with automatic PIN request handling. ****Warning**** Be careful when entering a new PIN. There is no way to obtain PIN status after it is changed. If the PIN is changed after two units have already authenticated and connected you will have perform a software or hardware reset for the devices to use the new PIN's if not the two units will still connect using the old stored PIN. **Format:** ATSP,<New PIN>,<Old PIN> **Parameters:** • *New PIN:* 16 alphanumeric characters MAX (Caps Sensitive, includes spaces)

	• *Old PIN:* 16 alphanumeric characters MAX (Caps Sensitive, includes spaces) **Factory Default:** default **EXAMPLE:** *TYPE :* **ATSP,1234567890123456,default**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Note:** If security is enabled in multipoint mode, all connected slaves will have to use the same PIN. There is no way to assign an individual PIN to each slave.
OP	**OVERWRITE PIN** **Function:** Overwrites the stored PIN without needing the old PIN. To use this command the PIN must be unlocked using ATSW29. **Format:** ATOP,<PIN> **Parameters:** • *PIN:* 16 alphanumeric characters MAX (Caps Sensitive, includes spaces) **EXAMPLE:** *TYPE :* **ATOP,1234**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> //If ATOP has not been enabled with ATSW29
ATPR	**RESPOND TO MANUAL PIN REQUEST** **Function:** Allows the user to manually enter a PIN after receiving the PIN REQUEST prompt from the radio. **Format:** ATPR,<PIN> **Parameters:** • *PIN:* 16 alphanumeric characters MAX (Caps Sensitive, includes spaces) **EXAMPLE:** *REPLY:* <cr_lf>**PIN REQUEST**<cr_lf> *TYPE :* **ATPR,default**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf>

2.12 Set Class of Device (COD)

SC	**SET COD** **Function:** Sets the COD. **Format:** ATSC,<COD> **Parameters:** • *COD:* Exactly 8, 16-bit hex values (0 thru F) based on the *Bluetooth* COD specification names published and maintained by the *Bluetooth* SIG. **Factory Default:** 00000000 – Which is undefined since this is set by the user based on the final OEM device it is installed in. **EXAMPLE:** *TYPE :* **ATSC,00020114**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,5 ***Note:*** Requires a reset for change to take affect.

2.13 Write 5913 Configuration Commands

S registers refer to memory locations used for configuration. The SW commands are used to assign values to various registers in the radio's flash memory that are stored in nonvolatile memory

SW20	**WRITE UART (Serial Port) SETTINGS** **Function:** Configures UART settings. **Format:** ATSW20,<Baudrate>,<Parity>,<Stop Bits>,<Store> **Parameters:** • *Baudrate:* 1200 – 921.6Kbps, enter ASCII Value from table below. ******Contact *BlueRadio*s for calculating and setting custom baud rates not listed in the table. As long as the equation BAUDRATE *0.004096 produces an integer value, then there will be 0% error in clocking for the baud rate.

Baudrate	ASCII Value	Error
No Change	0	-
1200	5	1.73%
2400	10	1.73%
4800	20	1.73%
9600	39	-0.82%
19.2k	79	0.45%
38.4k	157	-0.18%
57.6k	236	0.03%

	115.2k 472 0.03% 230.4k 944 0.03% 460.8k 1887 -0.02% 921.6k 3775 0.00% • *Parity:* 0 = None 1 = Odd 2 = Even • *Stop Bits:* 0 = One 1 = Two • *Store Parameters:* 0 = Do Not Store 1 = Store Parameters in Flash **Factory Default:** *Baudrate* = 39, *Parity* = 0, *Stop Bits* = 0 (8, N, 1 w/ hardware flow control RTS/CTS enabled) **EXAMPLE:** *TYPE :* ATSW20,39,0,0,1<cr> *// 9600 8,N,1 store in flash* *REPLY:* This unique Command does not reply with "OK" or "ERROR" because of internal UART data processing limitations and response timing. **Read Using:** ATSI,8 ***Notes:*** • Flow control is always enabled, short CTS/RTS together if not used. • The RTS line of the radio will be low when the radio is ready to receive data and high when its buffer is full. When RTS goes high wait until it returns to low before sending more data to avoid losing information. • To reconfigure radio back to default factory settings apply 3.3vdc on PIO#4 during initial power up for > 2sec.
SW21	**WRITE SLAVE SCAN INTERVALS AND WINDOWS** ****Warning**** Setting these will affect the inquiry and connection time. You could inadvertently set the scan interval too long and the window to short on the slave for a master connect request. Unless your application is battery powered slave and power conservation is critical leave at the factory default settings. The minimum Window allowed by the Bluetooth spec is 11.25msec. If you set isWindow = 0 the Slave device will not be discovered by any Master but you can still use the Slaves BT address and connect directly to it from a remote Master. **Function:** Configures Page Scan and Inquiry Scan Interval and Window for disconnected slave devices in time slots. **Format:** ATSW21,<psInterval>,<psWindow>,<isInterval>,<isWindow>

	Parameters: • *psInterval: Page Scan Interval* Integer Value 18 to 4096 (11.25ms to 2560ms), 0=Disabled Time [ms] = psInterval * 0.625ms • *psWindow: Page Scan Window* Integer Value 18 to 4096 (11.25ms to 2560ms), 0=Disabled Time [ms] = psWindow * 0.625ms • *isInterval: Inquiry Scan Interval* Integer Value 18 to 4096 (11.25ms to 2560ms), 0=Disabled Time [ms] = isInterval * 0.625ms • *isWindow: Inquiry Scan Window* Integer Value 18 to 4096 (11.25ms to 2560ms), 0=Disabled Time [ms] = isWindow * 0.625ms **Factory Default:** *psInterval* = 1024(640ms), *psWindow* = 512(320ms), *isInterval* = 1024(640ms), *isWindow* = 512(320ms) **EXAMPLE:** *TYPE :* **ATSW21,4096,18,4096,18**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,10 ***Notes:*** • Requires a reset for the settings to go into affect. • ATSW21,4096,18,4096,18 settings will result in a current draw for an unconnected slave of ~ 1mA average vs. 39mA average at default. • ATSW21,4096,18,4096,18 settings along with enabling Deep Sleep Mode will result in an unconnected slave current draw of ≈350uA average.
SW22	This S Register is not used.
SW23	This S Register is not used.
SW24	**WRITE RESPONSE, SECURITY, AUTO SCO, FILTER SETTINGS** **Function:** Configures response, security, auto sco, and filter settings. **Format:** ATSW24,<Response Type>,<Security>,<Auto SCO>,<Minor Filter> **Parameters:** • *Response Type:* 0 = Long Response

	1 = Short Response 2 = No Verbose Mode (No unsolicited responses will be output) - No OKs will come back, but requested information such as ATSI, ATRSW, ATRSN and ATDI responses will. - The radio will not output CONNECT or DISCONNECT messages. - In FTP and OPP modes the radio will still output all necessary messages such as PUSH START and PUSH COMPLETE. • **Security:* 56bit encryption is automatically enabled when set to 1. UART will reply PAIRED,<BT Address> before the CONNECT,<BT Address> is returned when a connection is made. 0 = No Authorization 1 = Authorization Required • *Auto SCO:* 0 = No Automatic SCO Connect 1 = SCO Auto Connect Upon Radio Connect. • ***Minor Filter:* 0 = Disable Minor COD Filter on Inquiry 1 = Enable Minor COD Filter on Inquiry **Factory Default:** *Response Type* = 0, *Security* = 0, *Auto SCO* = 0, *Filter* = 0 **EXAMPLE:** *TYPE :* **ATSW24,0,0,0,0**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,6 **Notes:** • See Appendix B for differences between short response and long response mode. • Requires a reset for security to go into affect. • *If security is enabled in multipoint mode, all connected slaves will have to use the same PIN. There is no way to assign an individual PIN to each slave. • **With the minor filter enabled, inquiry results are filtered by the lower 2 bytes of the COD. If the minor filter is disabled all devices are found.
SW25	**WRITE CONNECTION, COMM, UNCONNECTED UART, DEFAULT SERVICE MODES** ****Warning**** The only way to communicate to the radio after setting the radio in "Fast Data Mode" and "ignore UART while unconnected" is to apply 3.3Vdc on PIO(4) during initial power up for >2 sec. These settings are used if you have no control over the source of streaming data into the radio, or you do not know when the radio has made a Bluetooth

connection, and do not plan on sending any AT commands.

Function: Configures connection, comm, unconnected UART and default service modes.

Format: ATSW25,<Power-Up Connection Mode>,<Comm Mode>,<Unconnected UART Mode>, <Default Service Profile>

Parameters:

- *Power-Up Connection Mode:*

  0 = Slave
  1 = Auto-Master (Set ATSMA Command First)*
  2 = Idle Mode**
  3 = Slave Undiscoverable
  5 = Repeater (Set ATSMA Command First)***
  6 = Mesh Configuration
  7 = OPP Server (See FTP and OPP Modes Section for more info)
  8 = FTP Server (See FTP and OPP Modes Section for more info)

- *Comm Mode:*

  0 = Fast Data****
  1 = Data
  2 = Command

- *Unconnected UART Mode:*

  0 = Allow Data to Pass While Unconnected
  1 = Ignore Data While Unconnected

- *Default Service Profile: This field has no longer has any effect, it can just be set to 0. Service profile UUIDs are now set using the ATSSNC command.*

Factory Default: *Connection Mode* = 0, *Comm Mode* = 1, *Unconnected UART Mode* = 0, Default *Service Profile* = 0

EXAMPLE:

TYPE : **ATSW25,0,1,0,0**<cr> //Slave radio connects in fast data mode

REPLY: <cr_lf>**OK**<cr_lf>

OR

<cr_lf>**ERROR**<cr_lf>

Read Using: ATSI,7

Notes:

- Requires a reset for the settings to go into affect.
- *Auto-Connect Master always connects using the highest available channel. If none available it will continue to retry.
- **In idle mode the radio is neither slave nor master and draws 1.6mA of current but you can not communicate over the Bluetooth link in this state only through the TX & RX hardware UART.

	• ***Repeater always uses channel 00 for slave and 01 for Master. • ****If data mode is set to ‘‘Fast Data Mode’’ in a Master unit during a manual inquiry ‘‘ATDI’’ and/or connection request the radio connects in slow data mode not fast. This is because you will need the capability to issue commands because in fast data mode the AT command parser is turned off. • The comm mode parameter has no effect when operating in FTP or OPP mode.
SW26	**LOCK USER SETTINGS** ****Warning**** This command will lock the PIN. **Function:** Locks user settings to prevent unauthorized local & remote access. **Format:** ATSW26,<PIN>,<Lock/Unlock> **Parameters:** • *PIN:* 16 alphanumeric characters MAX (Caps Sensitive, includes spaces) • Lock/Unlock: 0 = Unlocked 1 = Locked **Factory Default:** Unlocked **EXAMPLE:** *TYPE :* **ATSW26,default,1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> ***Note:*** ATSW26 will still work after locking the user settings, allowing them to be unlocked.
SW27	**WRITE LED RATE** **Function:** Sets the LED Pulse Rate on PIO(5). **Format:** ATSW27,<Pulse Period> **Parameters:** • *Pulse Rate:* Integer decimal value from 1ms to 60,000ms ***Factory Default:*** 1000 **EXAMPLE:** *TYPE :* **ATSW27,1000**<cr> //1000 ms *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf>

	Read Using: ATSI,11 ***Note:*** Used to indicate slave mode operation and inquiry in process. Duty cycle equals 50%.
SW28	**WRITE INQUIRY AND MASTER TIMEOUT SETTINGS** **Function:** Configures inquiry and master connect timeout settings. **Format:** ATSW28,<Inquiry Timeout>,<Master Connect Request Timeout> **Parameters:** • *Inquiry Timeout:* Integer value from 1 to 40 [seconds] • *Master Connect Request Timeout:* Integer value from 1 to 40 [seconds] **Factory Default:** *Inquiry Timeout* = 16, *Master Connect Request Timeout* = 40 **EXAMPLE:** *TYPE :* **ATSW28,16,40**<cr> // factory default *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,13 ***Notes:*** • Due to a CSR bug, this command will accept values up to 40, but the actual timeouts will never go over approximately 22 seconds. • The master connect request timeout also controls the timeouts on the ATRRN, ATRRSN and ATPAIR commands.
SW29	**WRITE PIN LOCK MODE** **Function:** Configures PIN lock setting. **Format:** ATSW29,<PIN>,<Lock Mode> **Parameters:** • *PIN:* 16 alphanumeric characters MAX (Caps Sensitive, includes spaces) • Lock Setting: 0 = In Normal operation ATOP is disabled 1 = Allow ATOP through UART only 2 = Allow ATOP through UART and over RF Link **Factory Default:** 0 **EXAMPLE:** *TYPE :* **ATSW29,default,1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf>

	OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,15 ***Note:*** This command enables ATOP, described in the Security PIN Settings section.
SW30	**WRITE DEEP SLEEP MODE** **Function:** Configures deep sleep mode. **Format:** ATSW30,<Deep Sleep Mode> **Parameters:** • *Deep Sleep Mode:* 0 = Normal Operation never go into deep sleep 1 = Go into deep sleep whenever possible *(While idle, page scan or sniff mode)* **Factory Default:** 0 **EXAMPLE:** *TYPE :* **ATSW30,1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,16 ***Notes:*** • When the radio is in deep sleep you can not discover or connect to it. • The UART RX line needs to be pulled high if not active before power is applied to the radio module. • If there is an active UART RF link the device will need Sniff Mode enabled to allow it to drop into sleep mode when there is no traffic. • When in deep sleep, the UART will miss the first character while waking up. Send a preamble byte to allow it to wake up and immediately thereafter send the AT Command or data in less than 1 second or the device will go back to deep sleep again. • No bytes are lost if sending commands down over the remote RF link side. • This setting is stored in flash and does not require a reset to take affect. Takes approx. 1 second before the current will drop down to 25- 50uA. Allow 5msec. for the CPU unit to come out of deep sleep. • ATSW21,4096,18,4096,18 settings along with enabling Deep Sleep Mode will result in an unconnected slave current draw of ≈350uA average.

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2.14 Read 5913 Configuration

S registers refer to memory locations used for configuration. The SR commands are used to read values from various registers in the radio's Flash Memory that are stored in nonvolatile memory.

SR21	**READ PIO LEVEL** **Function:** Reads PIO logic level. **Format:** ATSR21,<PIO#> **Parameters:** • *PIO#:* 2-7 **Return Parameters:** <Logic Level> **EXAMPLE:** *TYPE :* **ATSR21,3**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**1**<cr_lf> **Set Using:** ATSW23

2.15 Inquiry Command

The inquiry command is used to discover all *Bluetooth* radios (within range) that match a certain Class of Device (COD)**.** If the COD is not known it is best to use 00000000 which allows discovery of all devices. You can not be in the default slave mode and perform an inquiry command. Only a Master or a Radio in idle mode can perform an inquiry.

DI	**INQUIRE** **Function:** Inquire Command. Used to discover other Bluetooth devices. **Format:** ATDI,<Max Radios to Discover>,<COD> **Parameters:** • *Max Radios to Discover:* 0-60,000 • **COD:* Exactly 8, 16-bit hex values (0 thru F) based on the *Bluetooth* COD specification names published and maintained by the *Bluetooth* SIG. Return Parameters: <BT Address>,<COD> (Repeated by number of radios found) • An "OK" is returned immediately following this command. "DONE" will appear after all devices have been found, or an inquiry *timeout* has occurred while searching for the number of devices specified. **EXAMPLE MASTER:** *TYPE :* **ATDI,1,00000000**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**00A0961F2023,00000000**<cr_lf>

	<cr_lf>**DONE**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> ***Notes:*** • Recommend executing an ATUCL command to put the radio in idle mode prior to executing an Inquiry command. See Utilities section. • Due to a CSR bug, there is no guarantee that the radios returned by an inquiry will all be unique – duplicates can occur. This seems to happen if the inquiry doesn't discover the maximum number of radios. After discovering all of the radios it can, it will then start to return duplicate radios that it has already discovered until the maximum is reached or the inquiry times out. • *With the minor filter enabled using ATSW24, inquiry results are filtered by the lower 4 bytes of the COD. If the minor filter is disabled all devices are found. • The request for friendly name is a separate message request in the new CSR firmware **–** see ATRRN.
IL	**LAST INQUIRY** **Function:** Repeats last inquiry. **Format:** ATIL **Return Parameters:** <BT Address>,<COD> • An "OK" is returned immediately following this command. "DONE" will appear after all devices have been found, or an inquiry *timeout* has occurred while searching for the number of devices specified. **EXAMPLE MASTER:** *TYPE :* **ATIL**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**00A0961F2023,00000000**<cr_lf> <cr_lf>**DONE**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> ***Note:*** ATDI command string previously used is stored in flash memory.

2.16 Connect as Master

This command is used to connect one 5913 radio module to another. Doing this will enable data transmission bidirectionally. When performing this command the reply is critical so as to understand where the connection process is. A connection can take several seconds, so when making a connection, if it is not already connected, an **"OK"** will be sent back immediately. Don't mistake this for a connection being complete. A completed connection will return **"CONNECT,00,123456789012"** some time after the command was sent typically less than 2

seconds. The blue LED on the 5913 will turn on and stay on while a *Bluetooth* connection is established on Channel connection 00.

Note:	If either the slave or the master of the connection issues a disconnect command the 5913 will output "DISCONNECT." If a connection is lost unexpectedly then "LINKLOSS" will be output.

DM	**DIAL AS MASTER** **Function:** This command creates a connection using the Slave's address and UUID profile code. **Format:** ATDM,<BT Address>,<UUID> **Parameters:** • *BT Address: Bluetooth* Address, 12 hex characters MAX • UUID: 4 digit, binary profile code (See Appendix C for more info) **Return Parameters:** <BT Address> or <Channel Number><BT Address> **POINT TO POINT EXAMPLE:** *TYPE :* **ATDM,123456789012,1101**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**CONNECT,123456789012**<cr_lf> OR <cr_lf>**OK**<cr_lf> <cr_lf>**PAIRED,123456789012**<cr_lf> // if security is enabled <cr_lf>**CONNECT,123456789012**<cr_lf> OR <cr_lf>**NO ANSWER**<cr_lf> // if device not present **MULTIPOINT EXAMPLE:** *TYPE :* **ATDM,123456789012,1101**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**CONNECT,00,123456789012**<cr_lf> OR <cr_lf>**OK**<cr_lf> <cr_lf>**PAIRED,123456789012**<cr_lf> // if security is enabled <cr_lf>**CONNECT,00,123456789012**<cr_lf> OR <cr_lf>**NO ANSWER**<cr_lf> // if device not present ***Notes:***

	• If the remote Slave device is not present or the service is not available, NO ANSWER will reply after the master connect timeout and you will have to try again. • If security is enabled and the radio is connecting to a PC that has not yet been paired with it, the <cr_lf>PAIRED,12345678912<cr_lf> message may return twice prior to the CONNECT. • By using the ATDC command connection time will be decreased to approximately 500ms.
DC	**DIAL CHANNEL** **Function:** Connects to a remote device by *Bluetooth* address and service channel number (RF Comm ID). This will decrease the connection time to approximately 500ms. **Format:** ATDC,<BT Address>,<Service Channel Number> **Parameters:** • *BT Address: Bluetooth* Address, 12 hex characters MAX • *Remote Service Channel#: 0-3* **Return Parameters:** <BT Address> or <Channel Number><BT Address> **POINT TO POINT EXAMPLE:** *TYPE :* **ATDC,123456789012,1**<cr> *REPLY:* <cr_lf>OK<cr_lf> <cr_lf>**CONNECT,123456789012**<cr_lf> OR <cr_lf>**OK**<cr_lf> <cr_lf>**PAIRED,123456789012**<cr_lf> // if security is enabled <cr_lf>**CONNECT,123456789012**<cr_lf> OR <cr_lf>**NO ANSWER**<cr_lf> // if device not present **MULTIPOINT EXAMPLE**: *TYPE :* **ATDC,123456789012,1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**CONNECT,00,123456789012**<cr_lf> OR <cr_lf>**OK**<cr_lf> <cr_lf>**PAIRED, 123456789012**<cr_lf> // if security is enabled <cr_lf>**CONNECT,00,123456789012**<cr_lf> OR

	<cr_lf>**NO ANSWER**<cr_lf> // if device not present ***Notes:*** • Use the ATRRSN command to get a remote service channel number from another device. • If the remote Slave device is not present or the service is not available, NO ANSWER will reply after the master connect timeout and you will have to try again. • If security is enabled and the radio is connecting to a PC that has not yet been paired with it, the <cr_lf>PAIRED,12345678912<cr_lf> message may return twice prior to the CONNECT.
DL	**DIAL LAST** **Function:** Connects to last successful Slave *Bluetooth* address connection over SPP unless ATDM command was executed then the UUID from the ATDM command will be used. **Format:** ATDL **Return Parameters:** <BT Address> or <Channel Number><BT Address> **POINT TO POINT EXAMPLE:** *TYPE :* **ATDL** *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**CONNECT,123456789012**<cr_lf> OR <cr_lf>**OK**<cr_lf> <cr_lf>**PAIRED,123456789012**<cr_lf> // if security is enabled <cr_lf>**CONNECT,123456789012**<cr_lf> OR <cr_lf>**OK**<cr_lf> <cr_lf>**NO ANSWER**<cr_lf> // if device not present OR <cr_lf>**ERROR**<cr_lf> **MULTIPOINT EXAMPLE**: *TYPE :* **ATDL** *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**CONNECT,00,123456789012**<cr_lf> OR <cr_lf>**OK**<cr_lf> <cr_lf>**PAIRED,123456789012**<cr_lf> // if security is enabled

	<cr_lf>**CONNECT,123456789012**<cr_lf> OR <cr_lf>**OK**<cr_lf> <cr_lf>**NO ANSWER**<cr_lf> // if device not present OR <cr_lf>**ERROR**<cr_lf> ***Notes:*** • To verify the stored address use the ATLAST command below. • If the remote Slave device is not present or the service is not available, NO ANSWER will reply after the master connect timeout and you will have to try again. • If security is enabled and the radio is connecting to a PC that has not yet been paired with it, the <cr_lf>PAIRED,12345678912<cr_lf> message may return twice prior to the CONNECT.
LAST	**READ LAST ADDDRESS** **Function:** Gets the last connected Bluetooth device address. **Format:** ATLAST **Return Parameters:** <BT Address> **EXAMPLE:** *TYPE :* **ATLAST**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**000000000000**<cr_lf> // Nothing stored *OR* <cr_lf>**OK**<cr_lf> <cr_lf>**123456789012**<cr_lf> // Last connected BT address

2.17 Set Master Default Bluetooth Address

SMA	**SET MASTER DEFAULT ADDRESS** **Function:** This command will set a specific Bluetooth Slave address and service profile into the Master device so on power up the Master will automatically search and connect to a unique Slave device on the highest available channel. **Format:** ATSMA,<BT Address>,<UUID> **Parameters:** • *BT Address: Bluetooth* Address, 12 hex characters MAX

	• UUID: 4 digit, binary profile code (See Appendix C for more info) **EXAMPLE:** *TYPE :* **ATSMA,00A0961F904F,1101**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,9 ***Notes:*** • Execute ATSW25 to set the power up connect mode to auto-master before using the above command if still in slave mode. • This command is limited to only one connection. Reset module for change to take affect.
MACLR	**MASTER ADDRESS CLEAR** **Function:** Clears stored slave address. **Format:** ATMACLR **EXAMPLE:** *TYPE :* **ATMACLR**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf>

2.18 Connect as Slave

Note: If either the slave or the master of the connection issues a disconnect command the radio will output "DISCONNECT."

If a connection is lost unexpectedly then "LINKLOSS" will be output.

DS	**DIAL AS SLAVE** **Function:** This command places the Radio in Slave mode where it waits for a connection to occur from a Master. **Format:** ATDS **Return Parameter:** OK **EXAMPLE SLAVE**: *TYPE :* **ATDS**<cr> *REPLY:* <cr_lf>**OK**<cr_lf>

2.19 Disconnect

DH	**DIAL HANG UP** **Function:** This command will disconnect the current connection on channel 0. **Format:** ATDH **EXAMPLE:** *TYPE :* **ATDH**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**DISCONNECT**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> ***Notes:*** • If you send this command over the RF link to a remote BlueRadios Slave the Slave will disconnect and go into Idle mode not Slave mode by design. • If a connection should unexpectedly be lost the response will be <cr_lf>LINKLOSS<cr_lf> instead of <cr_lf>DISCONNECT<cr_lf>.
DHC	**DIAL HANG UP BY CHANNEL** **Function:** This command will issue disconnect to the specified channel. **Format:** ATDHC,<Channel Number> **EXAMPLE:** *TYPE :* **ATDHC,00**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**DISCONNECT,00**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> ***Notes:*** • If you send this command over the RF link to a remote BlueRadios Slave the Slave will disconnect and go into Idle mode not Slave mode by design. • If a connection should unexpectedly be lost the response will be <cr_lf>LINKLOSS,00<cr_lf> instead of <cr_lf>DISCONNECT,00<cr_lf>.

2.20 Command and Data Modes

+++	**PUT RADIO INTO COMMAND MODE** **Function:** This sequence is used to force the radio into command mode state. If the Radio has been placed in Fast Data Mode this command will have no affect and the typed

	command will be treated as data. When using this command allow at least 100ms delay before sending the next AT command. **Format:** +++ **Return Parameters:** If successful an "OK" is returned, or nothing will be returned if already in data or fast data mode, and connected. **EXAMPLE:** *TYPE :* **+++**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> ***Note:*** This command is only required if the module is RF CONNECTED, it has not effect if the module is not connected or if it is connected in Fast Data Mode.
SESC	**SET COMMAND MODE ESCAPE CHARACTER** **Function:** Sets the radio's escape character, used to put the radio into command mode. **Format:** ATSESC,<ASCII Value> **Parameter:** • *ASCII Value:* Integer value of a non extended ACII character **Factory Default:** 43 = "+" **EXAMPLE:** *TYPE :* **ATSESC,43**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf>
MD	**PUT RADIO INTO DATA MODE** **Function:** Forces the radio into Data Mode. In order for this to have an effect the Radio has to be CONNECTED. **Format:** ATMD **Return Parameters:** If successful an "OK" is returned, or nothing will be returned if already in data or fast data mode, and connected. A "NO CARRIER" occurs when the Bluetooth connection has been lost. **EXAMPLE:** *TYPE :* **ATMD**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**NO CARRIER**<cr_lf>
MF	**PUT RADIO INTO FAST DATA MODE**

	Function: Forces the radio into Fast Data Mode on channel 00 only. Once in Fast Data Mode all commands are treated as data. Ways to get out of this mode are to reset power on the radio, or strobe PIO(4) while connected. **Format:** ATMF **Return Parameters:** If successful an "OK" is returned, or nothing will be returned if already in data or fast data mode, and connected. A "NO CARRIER" occurs when the Bluetooth connection has been lost. **EXAMPLE:** TYPE : **ATMF**<cr> REPLY: <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> OR <cr_lf>**NO CARRIER**<cr_lf>

2.21 Cancel Command

UCL	**CANCEL** **Function:** The UCL command tells the radio to cancel inquiry or connect requests commands and then places the radio in Idle Mode. This command can come in handy for a quick exit from commands like inquiry mode if there are no devices in the area and you do not want to wait for an automatic timeout. You can not issue a cancel command while RF connected. This command can also be used to break out of the auto-master connect mode. If executed while connected in this mode, the radio will disconnect and enter idle mode instead of attempting to connect again. **Format:** ATUCL **EXAMPLE:** *TYPE :* **ATUCL**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf>

2.22 Pairing Commands

PAIR	**PAIR RADIOS** **Function:** This command tells the radio in Master mode to pair to a specific *Bluetooth* address.

	Format: ATPAIR,<BT Address> **Parameters:** • *BT Address: Bluetooth* Address, 12 hex characters MAX **EXAMPLE:** *TYPE :* **ATPAIR,00A0961F008F**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**PAIRED,123456789012**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> OR <cr_lf>**PAIRED,FAILED**<cr_lf> **Read Using:** ATSI,19 ***Notes:*** • The pairing timeout is 30 seconds. • The radio needs to be in idle mode prior to pairing. • Security PINs are exchanged and must be equal for pairing to complete. • The timeout for this command is controlled by the master connect timeout in ATSW28.
UPAIR	**UNPAIR BY INDEX** **Function:** The command tells the radio to unpair from the Bluetooth address stored in index locations 00, 01, 02, and 03. **Format:** ATUPAIR,<Index> **Parameters:** • *Index: Index location 00, 01, 02 or 03* **EXAMPLE:** *TYPE :* **ATUPAIR,00**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> ***Notes:*** • Use the command ATLAST to view the stored address after pairing. • Pairing is not the same as a connection, so you will not see an inquiry or connection indication. Can be in Master, Slave, or Idle mode to unpair. Will need to reset or cycle power to clear paired address.

UPAIRB	**UNPAIR BY BLUETOOTH ADDRESS** **Function:** This command tells the radio to unpair from the specified Bluetooth address. **Format:** ATUPAIRB,<BT Address> **Parameters:** • *BT Address: Bluetooth* Address, 12 hex characters MAX **EXAMPLE:** *TYPE :* **ATUPAIR,123456789012**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf>
CPAIR	**CLEAR ALL PAIRED DEVICES** **Function:** This command tells the radio to unpair from all paired devices. **Format:** ATUPAIRC **EXAMPLE:** *TYPE :* **ATCPAIR**<cr> *REPLY:* <cr_lf>**OK**<cr_lf>

2.23 3.7.3 Sniff and Park (Connected Slave)

These commands are supported in Point-to-Point mode only.

2.23.1 Low Power Modes Using Sniff

Bluetooth connections are master/slave in nature. A master sends packets and a slave has to acknowledge that packet in the next timeslot. Timeslots in *Bluetooth* are 625 microseconds wide. This implies that a master will always know when packets will be sent and received, which further means it is able to optimize power usage by switching on power hungry circuitry only when needed.

A slave on the other hand does NOT have prior knowledge of when a packet will be received and has to assume that a packet will be received from a master on every receive slot. This means that it has to leave it's receiving circuitry on for most of the receive slot duration. The result of this is high power consumption where a slave with no data transmission still consumes around 5mA.

This problem was identified very early in the evolution of *Bluetooth* (especially since headsets spend all their time as a slave in a *Bluetooth* connection) and it was solved by having a mode called Sniff, with appropriate lower layer negotiating protocol.

Sniff mode during connection is basically an agreement between the slave and its master, which data packets will only be, exchanged for N timeslots every M slots. The slave can then assume that it will never be contacted during N-M slots, and so can switch its power hungry circuitry off. The specification goes further by also specifying a third parameter called 'timeout' (T) which specifies

'extra' timeslots that the slave will agree to listen for after receiving a valid data packet. Put another way, if a data packet is received by the slave, then it knows that it MUST carry on listening for at least T more slots. If within that T slot time period another data packet is received, then the timer is restarted. This mechanism ensures low power consumption when there is no data transfer – at the expense of latency. When there is a lot of data to be transferred, it acts as if sniff mode were not enabled.

It is stated above that during sniff mode, a slave listens for N slots every M slots. The *Bluetooth* specification states that a master can have up to 7 slaves attached to it with all slaves having requested varying sniff parameters. It may therefore be impossible to guarantee that each slave gets the M parameter it requested. In light of this, the protocol for enabling sniff mode specifies that a requesting peer specify the M parameter as a minimum and maximum value. This will allow the master to interleave the sniff modes for all slaves attached.

SNIFF	**ENABLE SNIFF** **Function:** Manually enables sniff mode for Slave device connected in time slots. **Format:** ATSNIFF,<Max Interval>,<Min Interval>,<Attempt>,<Timeout> **Parameters:** • Max Interval: Integer Value Time [ms] = *Max Interval* * 0.625ms • Min Interval*:* Integer Value Time [ms] = Min Interval * 0.625ms • Attempt*:* Integer Value Time [ms] = Attempt * 0.625ms • Timeout*:* Integer Value Time [ms] = Timeout * 0.625ms **EXAMPLE:** *TYPE :* **ATSNIFF,1600,160,10,160**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**NO CARRIER**<cr_lf> ***Notes:*** • Manually enable sniff results in an always connected slave using only 2mA average current when no data is sent. Takes about 7 seconds before the current drops after the connection is established. Parameters are lost after connection is dropped. • The radio will exit sniff mode once the connection is terminated, ATSNIFF must be executed again upon establishing a new connection in order to start sniff mode again.
SSNIFF	**ENABLE AUTO SNIFF**

	****Warning**** Sniff seems to intermittently work using this command. Approximately 1 in 5 connections will not automatically go into sniff mode. Use ATSNIFF to guarantee that sniff mode is started correctly. **Function:** Stores sniff parameters permanently in flash and auto starts sniff mode after a connection is established. **Format:** ATSSNIFF,<Max Interval>,<Min Interval>,<Attempt>,<Timeout> **Parameters:** • *Max Interval:* Integer Value Time [ms] = *Max Interval* * 0.625ms • Min Interval*:* Integer Value Time [ms] = Min Interval * 0.625ms • Attempt*:* Integer Value Time [ms] = Attempt * 0.625ms • Timeout*:* Integer Value Time [ms] = Timeout * 0.625ms **EXAMPLE:** *TYPE :* **ATSSNIFF,1600,160,10,160**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,17
CSNIFF	**CLEAR SNIFF** **Function:** Clears stored sniff parameters. **Format:** ATCSNIFF **EXAMPLE:** *TYPE :* **ATCSNIFF**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf>
XSNIFF	**EXIT SNIFF** **Function:** Tells the radio to exit and stop "sniffing" RF signals. **Format:** ATXSNIFF **EXAMPLE:** *TYPE :* **ATXSNIFF**<cr>

	REPLY: <cr_lf>**OK**<cr_lf> OR <cr_lf>**NO CARRIER**<cr_lf>
PARK	**ENABLE PARK** **Function:** Manually enables park mode for device connected in time slots. **Format:** ATPARK,<Max Interval>,<Min Interval> **Parameters:** • *Max Interval:* Integer Value Time [ms] = *Max Interval* * 0.625ms • Min Interval*:* Integer Value Time [ms] = Min Interval * 0.625ms **EXAMPLE:** *TYPE :* **ATPARK,1000,11**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**NO CARRIER**<cr_lf> ***Notes:*** • Allow 7 seconds for the slave to drop its average current draw from 45mA to 3mA and go into PARK. Any UART traffic will cause the Slave radio go back to full operation within 5msec of the first character for 7 seconds before going back into PARK mode without subsequent data. The Slave will remain connected to the Master because the BlueRadios Module only supports one connection. • Both units are required to support park. Park request is sent from both Master and Slave to go into affect only during an active Bluetooth connection. The order does not matter.
XPARK	**EXIT PARK** **Function:** Tells the radio to exit the park mode. **Format:** ATXPARK **EXAMPLE:** *TYPE :* **ATXPARK**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**NO CARRIER**<cr_lf> ***Note:*** Unit will immediately exit park.

2.24 RSSI and Link Quality

The lower threshold level of the Golden Receive Power Range corresponds to a receive power between -56 dBm and 6 dB above the actual sensitivity of the receiver. The upper threshold level is 20 dB above the lower threshold level to an accuracy of +/-6 dB.

RSSI	**GET RSSI VALUE** **Function:** This command is used to obtain the RSSI value for an open connection on channel 0. This is a parameter associated with the ACL connection to a peer device. **Format:** ATRSSI **Return Parameters:** <RSSI Value> • RSSI Value is in hex, typically from -10 to +31 in integer dB value. EXAMPLE: *TYPE :* **ATRSSI**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**+00**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> ***Notes:*** • The RSSI value will be + 00 if the signal is within the Golden Range. • The Golden Range min and max value is 1 and 12 respectively for the modules. • This value is the difference between the measured Received Signal Strength Indication (RSSI) and the limits of the Golden Receive Power Range (see below for definition). Any positive RSSI value returned by the Host side indicates how many dB the RSSI is above the upper limit .Any negative value indicates how many dB the RSSI is below the lower limit. A value of zero indicates that the RSSI is inside the Golden Receive Power Range. • How accurate the dB values will be depends on the Bluetooth hardware. The only requirements for the hardware are that the Bluetooth device is able to tell whether the RSSI is inside, above, or below the Golden Device Power Range.
RSSIC	**GET RSSI VALUE BY CHANNEL** **Function:** Gets the RSSI Value by channel number. **Format:** ATRSSIC,<Channel Number> **Parameters:** • *Channel Number:* 0, 1, 2, 3 **Return Parameters:** <RSSI Value> • RSSI Value is in hex, typically from -10 to +31 in integer dB value.

	EXAMPLE: *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**+00**<cr_lf> OR <cr_lf>**ERROR**<cr_lf>
LQ	**GET LINK QUALITY** **Function:** Gets the link quality of the current connection. **Format:** ATLQ **Return Parameters:** <Link Quality> • Hex value from 0 to 255 decimal which is the measure of Bit Error Rate (BER) **EXAMPLE:** *TYPE :* **ATLQ**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**FF**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> ***Note*:** Link Quality is a Hex value from 0-255, which represents the quality of the link between two Bluetooth devices. The higher the value, the better the link quality is. Each Bluetooth module vendor will determine how to measure the link quality. In the case for CSR, this value is a measure of BER.
LQC	**GET LINK QUALITY BY CHANNEL** **Function:** Gets the Link Quality by channel number. **Format:** ATLQC,<Channel Number> **Parameters:** • *Channel Number:* 0, 1, 2, 3 **Return Parameters:** <RSSI Value> • Hex value from 0 to 255 decimal which is the measure of Bit Error Rate (BER) **EXAMPLE:** *TYPE :* **ATLQ,1**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**FF**<cr_lf> OR <cr_lf>**ERROR**<cr_lf>

2.25 Audio (SCO) PCM Interface

DSCO	**DIAL SCO** **Function:** Tells the radio to dial and connect the audio channel. **Format:** ATDSCO **EXAMPLE:** *TYPE :* **ATDSCO**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**SCO CONNECT**<cr_lf> OR <cr_lf>**OK**<cr_lf> <cr_lf>**SCO FAILED**<cr_lf> OR <cr_lf>**NO CARRIER**<cr_lf>
DHSCO	**DIAL HANG UP SCO** **Function:** Tells the radio to disconnect the audio channel. **Format:** ATDHSCO **EXAMPLE:** *TYPE :* **ATDHSCO**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**SCO DISCONNECT**<cr_lf> OR <cr_lf>**NO CARRIER**<cr_lf>

2.26 Max TX Power

SPF	**SET MAX TX POWER LEVEL** **Format:** ATSPF,<Power Level>,<Sign> **Parameters:** • *Power Level:* Integer from 0 to 10 • *Sign:* + or – (Combined value of level and sign must be in the range of -5 to +10) Typical *BlueTooth* Industry Values Depending On Device Class Type: - Class 1 = 0dBm to +10dBm - Class 2 = -8dBm to +4dBm

	- Class 3 = 0dBm Max *BlueRadios* Power Table Values: Class 1 Power Table — Class 2 Power Table "fixed" -5 dBm — 0 dBm 0 dBm — 0 dBm 5 dBm — 0 dBm 10 dBm — 0 dBm **Factory Default:** 10dBm for Class 1 and 0dBm for Class 2 devices. **EXAMPLE:** *TYPE :* **ATSPF,5,+**<cr> // +5dBm *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,14 ***Note:*** The default value is 0dBm in a class2 BlueRadios module the max performance is still 0dBm output gain for the class2 radio if set above this .This value does not include gains associated with the external antenna (2 dBm). The firmware uses the highest value in the power table that is less than or equal to the requested max transmit power number above.

2.27 Link Supervisory Timeout

LSTO	**LINK SUPERVISORY TIMEOUT** **Function:** This command tells the radio to drop the connection if the units can not handshake for X amount of time in seconds. **Format:** ATLSTO,<Time> **Parameters:** • *Time:* Integer value from 2 to 41 **Factory Default:** 4 (~4s) **EXAMPLE:** *TYPE :* **ATLSTO,20**<cr> // Sets timeout to ~20 seconds *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,18 ***Note:*** If timeout is set for too short of a duration you may inadvertently drop the connection prematurely if the RF link margin is poor.

2.28 Variable Storage

STORE	**STORE VARIABLE** **Function:** Allows user to permanently store data – ID's, addresses, etc. **Format:** ATSTORE,<Index>,<String> **Parameters:** • *Index:* 0 = Location 0 1 = Location 1 • String: 16 alphanumeric characters MAX **EXAMPLE:** *TYPE :* **ATSTORE,0,1234567890123456**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf>
READ	**READ VARIABLE** **Function:** Allows user to read a stored variable. **Format:** ATREAD,<Index> **Parameters:** • *Index:* 0 = Location 0 1 = Location 1 **Return Parameters:** <String> **EXAMPLE:** *TYPE :* **ATREAD,0**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> <cr_lf>**1234567890123456**<cr_lf> ***Note:*** Nothing stored will return blank

2.29 Transmitting on a Specific Channel Only

SWC	**SELECT TRANSMISSION CHANNEL** **Function:** Allows the user to select a single channel to transmit on in multipoint mode. The radio can still receive data from any of the other three channels.

	Format: ATSWC,<Select>,<Channel> **Parameters:** • Select: 0 = Deselect the channel as the current transmission channel 1 = Select the channel as the current transmission channel • Channel: 0-3 **EXAMPLE:** *TYPE :* **ATSWC,1,0**<cr> *REPLY:* <cr_lf>**OK**<cr_lf> OR <cr_lf>**ERROR**<cr_lf> **Read Using:** ATSI,21 ***Note:*** If the selected channel is disconnected the radio will default to transmitting on all channels.

2.30 Making the 5913 Discoverable and Undiscoverable

SDIS	**SET DISCOVERABLE** **Function:** Makes the radio discoverable and connectable. **Format:** ATSDIS **EXAMPLE:** *TYPE :* **ATSDIS**<cr> *REPLY:* <cr_lf>**OK**<cr_lf>
UDIS	**SET UNDISCOVERABLE** **Function:** Makes the radio undiscoverable and unconnectable. **Format:** ATUDIS **EXAMPLE:** *TYPE :* ATSDIS<cr> *REPLY:* <cr_lf>OK<cr_lf>

3 AT Command Summary Table

AT Command	Description	Requires Reset	Stores Permanently
Attention Prefix			
AT	Attention Prefix	N/A	N/A
Firmware Version			
ATVER,ver1	Module Firmware Version	N/A	Yes
Resetting			
ATURST	Unit Reset	N/A	N/A
ATFRST	Factory Reset	N/A	N/A
ATSSW,0	Set Bypass Factory Reconfiguration	Yes	Yes
ATRSW,0	Read Bypass Factory Reconfiguration	N/A	Yes
Boot Mode			
ATSSW,1	Set Boot Mode	Yes	Yes
ATRSW,1	Get Boot Mode	N/A	N/A
Security Level			
ATSSW,2	Set Security Level	Yes	Yes
ATRSW,2	Get Security Level	N/A	N/A
Get Status			
ATSI,0	Get Module Type	N/A	Yes
ATSI,1	Get *Bluetooth* Address	N/A	Yes
ATSI,2	Get Friendly Name	N/A	Yes
ATSI,3	Get Current Status of Connections	N/A	Yes
ATSI,4	Get Service Name	N/A	Yes
ATSI,5	Get Class of Device (COD)	N/A	Yes
ATSI,6	Get Response, Security, Auto SCO, Filter Settings	N/A	Yes
ATSI,7	Get Connection, Comm, UART, Service Modes	N/A	Yes
ATSI,8	Get UART Settings	N/A	Yes
ATSI,9	Get Master Auto-Connect Address	N/A	Yes
ATSI,10	Get Slave Scan Intervals and Windows	N/A	Yes
ATSI,11	Get PIO(5) Pulse Rate	N/A	Yes
ATSI,12	Get Escape Character	N/A	Yes
ATSI,13	Get Timeout Settings	N/A	Yes
ATSI,14	Get Maximum TX Power Level	N/A	Yes
ATSI,15	Get PIN Lock Mode	N/A	Yes
ATSI,16	Get Deep Sleep Mode	N/A	Yes
ATSI,17	Get Sniff Settings	N/A	Yes
ATSI,18	Get Link Supervisory Timeout	N/A	Yes
ATSI,19	Get List of Paired or Secured Addresses	N/A	Yes
ATSI,20	Get Channel UUIDs	N/A	Yes
ATSI,21	Get Specific Transmission Channel	N/A	Yes
ATSI,22	Get FTP/OPP Connection Status	N/A	Yes

AT Command	Description	Requires Reset	Stores Permanently
# of Connections			
ATSSW,3	Set Max Connection Number	Yes	Yes
ATRSW,3	Read Max Connection Number	N/A	Yes
Radio Name			
ATSN	Set Radio Name	No	Yes
ATRRN	Read Remote Radio Name By BT Address	N/A	Yes
Service Name			
ATSSN	Set Service Name	Yes	Yes
ATSSNC	Set Service Name by Channel	Yes	Yes
ATRSN	Read Service Name	N/A	Yes
ATRSNC	Read Service Name by Channel	N/A	Yes
ATRRSN	Read Remote Service Name	N/A	Yes
Security PIN			
SSW,6	Set PIN Request Handling Mode	Yes	Yes
RSW,6	Read PIN Request Handling Mode	N/A	Yes
ATSP	Set PIN	No	Yes
ATOP	Overwrite PIN	No	Yes
ATPR	Respond to Manual PIN Request	N/A	No
COD			
ATSC	Set Class of Device (COD)	Yes	Yes
Write Memory			
ATSW,20	Switch 20: Write UART Settings	No	Optional
ATSW,21	Switch 21: Write Slave Scan Intervals & Windows	Yes	Yes
ATSW,22	Switch 22: Write PIO Direction	No	Optional
ATSW,23	Switch 23: Write PIO Level	No	Optional
ATSW,24	Switch 24: Write Default Settings	For Security	Yes
ATSW,25	Switch 25: Write Power Up Default Modes	Yes	Yes
ATSW,26	Switch 26: Lock User Settings	No	Yes
ATSW,27	Switch 27: Write LED Rate	No	Yes
ATSW,28	Switch 28: Write Inquiry Timeout Settings	No	Yes
ATSW,29	Switch 29: Write PIN Lock Mode	No	Yes
ATSW,30	Switch 30: Write Deep Sleep Mode	No	Yes
Read Memory			
ATSR21	Read PIO Level	N/A	N/A
Inquiry			
ATDI	Dial Inquiry	N/A	N/A
ATIL	Last Inquiry	N/A	Yes
Master Connect			
ATDM	Dial As Master	N/A	N/A
ATDC	Dial Channel	N/A	N/A

AT Command	Description	Requires Reset	Stores Permanently
ATDL	Dial Last	N/A	Yes
ATLAST	Read Last Connected Address	N/A	Yes
Master Default			
ATSMA	Set Master Default Address	Yes	Yes
ATMACLR	Master Address Clear	No	Yes
Connect Slave			
ATDS	Dial As Slave	N/A	N/A
Disconnect			
ATDH	Dial Hang Up	N/A	N/A
ATDHC	Dial Hang Up By Channel	N/A	N/A
Modes			
+++	Default Escape Character	N/A	N/A
ATSESC	Set Command Mode Escape Character	No	Yes
ATMD	Put Radio Into Data Mode	No	No
ATMF	Put Radio Into Fast Data Mode	No	No
Cancel			
ATUCL	Cancel (Idle Mode)	No	No
Pairing			
ATPAIR	Pair Radios	No	Yes
ATUPAIR	Unpair By Index	No	Yes
ATUPAIRB	Unpair By Bluetooth Address	No	Yes
ATCPAIR	Clear all paired or secured connections	No	Yes
Sniff and Park			
ATSNIFF	Enable Sniff	No	Yes
ATSSNIFF	Enable Auto Sniff	No	Yes
ATCSNIFF	Clear Sniff	No	Yes
ATXSNIFF	Exit Sniff	No	N/A
ATPARK	Park	No	No
ATXPARK	Exit Park	No	N/A
RSSI and Link			
ATRSSI	Get RSSI Value	N/A	No
ATRSSIC	Get RSSI Value by Channel	N/A	No
ATLQ	Get Link Quality	N/A	No
ATLQC	Get Link Quality by Channel	N/A	No
Audio PCM			
ATDSCO	Dial SCO	N/A	N/A
ATDHSCO	Dial Hang Up SCO	N/A	N/A
Max TX Power			
ATSPF	Set Max TX Power Level	No	Yes
Link Timeout			
ATLSTO	Link Supervisory Timeout	No	Yes
Variable			

AT Command	Description	Requires Reset	Stores Permanently
Storage			
ATSTORE	Store Variable	No	Yes
ATREAD	Read Variable	N/A	Yes
Conn PIO Logic			
ATSSW,4	Set Connection PIO Logic	No	Yes
Transmission Ch			
ATSWC	Select Transmission Channel	No	No
Discoverability			
ATSDIS	Set Discoverable	No	No
ATUDIS	Set Undiscoverable	No	No
FTP Client			
ATDFTP	Dial FTP	No	No
ATDHFT	Dial Hang Up	No	No
ATFTPB	FTP Browse	No	No
ATFTPSUB	Move to FTP Sub-Directory	No	No
ATFTPUP	Move to FTP Parent Directory	No	No
ATFTPROOT	Move to Root Directory	No	No
ATFTPPUSH	FTP Push	No	No
ATFTPPULL	FTP Pull	No	No
OPP Client			
ATDOPP	Dial OPP	No	No
ATDHOPP	Dial Hang Up	No	No
ATWBCARD	Push Business Card	No	No
ATRBCARD	Pull Business Card	No	No
ATOPPUSH	Move	No	No
OPP Server			
ATBCARDR	ATBCARDR	No	No

4 5913 Factory Default Settings

The 5913 may be reset to the factory default settings using one of the following methods:

- While power is applied to the 5913 press the reset button (using a paperclip) for 1 second.
- Use the software command **ATFRST.**

The only exception for these two options is the name of device (friendly name) and the PIN will not change back if they have been changed.

- Bypass Hardware Factory Reset = Enabled
- Escape Character = '+'
- Max Connection Number = 1
- Radio Name = "BlueRadios"
- Country Code = North America and Europe
- Module Type = BlueRadios ATMP
- Boot Mode = Virtual Machine (VM) Mode
- Service Name = "COM0" (Ch0), "COM1" (Ch1), "COM2" (Ch2), "COM3" (Ch3)
- PIN = "default"
- COD = 00000000
- UART Setting = 9600 Baud, 8 Data Bits, No Parity, 1 Stop Bit (8,N,1)
- Hardware flow control RTS/CTS = Enabled
- Page Scan Interval = 1024 (640ms)
- Page Scan Window = 512 (320ms)
- Inquiry Scan Interval = 1024 (640ms)
- Inquiry Scan Window = 512 (320ms)
- Response Type = Long Response
- Security = Disabled (If the security flag is enabled a factory reset of parameters does not disable security)
- Security Level = Link Level, if security flag is enabled services are provided only with PIN exchange.
- Automatic SCO Connect = Disabled
- Minor Filter = Disabled
- Default Boot Mode = Slave
- Radio Status = 1,0 (Slave Disconnected)
- Default Comm Mode = Data
- Unconnected UART Mode = Allow Data to Pass While Unconnected
- Bluetooth Service Profile = Serial Port Profile (SPP)
- Lock User Settings = Disabled
- Inquiry Timeout = 16s
- Master Connect Request Timeout = 40s
- PIN Lock Mode = ATOP Disable

- Deep Sleep Mode = Never Go Into Deep Sleep
- Pairing Timeout = 30 seconds
- Class1 Radio Max Transmit Power = 15dbm. Class2 module will still have a max of 4dbm output performance even though you can set it to 15.
- Link Supervisory Timeout = ~4s

Miscellaneous Items:

- Over the air RF guaranteed data packet retries is set for indefinite.

5 Acronyms/Abbreviations

API - Application Protocol Interface
AT – Attention
ATMP – Attention Multi Point
ASCII - American Standard Code for Information Interchange
BCSP - Blue Core Serial Port
BNEP - Bluetooth Networking Encapsulation Protocol
BR - BlueRadios
BT - Bluetooth
BTW - Bluetooth Windows Stack
COD - Class Of Device
COM - Communications
CR - Carriage Return
CTS - Clear To Send
DSR - Data Sent Receive
GND - Ground
HCI - Host Controller Interface
IP – Internet Protocol
LF - Line Feed
MCU - Microcontroller Unit
MISO - Master In Slave Out
MOSI – Master Out Slave In
NC - Not Connected
PC - Personal Computer
PCB - Printed Circuit Board
PCM - Pulse Code Modulation
PAN - Personnel Area Networking
PIN - Personal Identification Number
RF - Radio Frequency
PIO - Pin Input/Output
RST - Reset
RTS - Ready To Send
RX - Receive
SCO - Synchronous Connection-Oriented: the links used by BT to send audio.
SMT - Surface Mount Technology
SPI - Serial Protocol Interface
SPICK - SPI Clock
SPICS - SPI Chip Select
TTL - Transistor Transistor Logic
TX - Transmit
UART - Universal Asynchronous Receiver/Transmitter
USB - Universal Serial Bus
UUID - Universal Unique Identifier – maintain by Bluetooth SIG.
VCC - DC Power
VDD - DC Power
VM – Virtual Machine

6 Maintenance

This module requires no routine maintenance. If the module is not functioning correctly, contact Control Microsystems Technical Support for more information and instructions for returning the module for repair.